BPW

Atty. Dkt. No. 029437-0108

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Yasuhiro OKAMOTO et al.
Title:	FIELD-EFFECT TRANSISTOR
Appl. No.:	10/538,739
International Filing Date:	12/15/2003
371(c) Date:	11/09/2005
Examiner:	Sarah Kate Salerno
Art Unit:	2814
Confirmation Number:	7288

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.56

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicants in order to comply with Applicants' duty of disclosure pursuant to 37 CFR §1.56.

A copy of each non-U.S. patent document and each non-patent document is being submitted to comply with the provisions of 37 CFR §1.97 and §1.98.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

TIMING OF THE DISCLOSURE

The listed documents are being submitted in compliance with 37 CFR §1.97(c), before the mailing date of either a final action under 37 CFR §1.113, a notice of allowance under 37 CFR §1.311, or an action that otherwise closes prosecution in the application.

RELEVANCE OF EACH DOCUMENT

The documents listed on the attached PTO/SB/08 were cited as being relevant during the prosecution of the corresponding Chinese application. A partial English translation of the Chinese Office Action of December 21, 2007, follows:

> Claim 1 seeks to protect a field-effect transistor. Reference document 1 (D1) (Li J., et al., Electronics Letters, 2001, 37(3): 196-197) discloses a GaN HEMT device structure with a field plate, and specifically disclosed the following technical features (see, page 196 and Fig. 1 of D1): AlGaN/GaN heterojunction material-based HEMT device has a gate terminal field plate which is formed by an extension portion of the gate toward drain, namely, the AlGaN/GaN HEMT device has an asymmetric gamma gate structure, and a silicon nitride SiN_x passivation layer having a uniform thickness formed below the gamma gate field plate and in the other positions of AlGaN barrier layer. D2 provides an insulated-gate AlGaN/GaN HEMT device which employs an embodiment of double layered gate medium of silicon nitride/silicon dioxide SiN_x/SiO_2 (and SiO_2 has a relative dielectric constant lower than that of SiN_x), so as to achieve a higher gate-drain breakdown voltage and a higher switching speed, and obtain the purpose for balancing the current collapse effect and the gate-drain breakdown voltage.
>
> Claim 2 is a dependent claim of claim 1, and its additional technical feature "second insulating film is laminated on said first insulating film" in the characterizing portion has been correspondingly disclosed in D2, (see, page 25.5.3 and Fig. 5 of D2): in the HEMT device of D2, the insulating film SiO_2 is formed between gate and SiN_x passivation layer.

Claim 3 is a dependent claim of claims 1 or 2, and its additional technical feature "the thickness of said first insulating film is not more than 150 nm" in the characterizing portion has been correspondingly disclosed in D2 (see, Fig. 5 of D2): in the HEMT device of D2, the thickness of SiN_x passivation layer is 15 nm.

Claim 4 is a dependent claim of any one of claims 1-3, and its additional technical feature in the characterizing portion is: the dielectric constant of said second insulating film is not more than 3.5. In the HEMT device disclosed by D2, the insulating film on silicon nitride is made of silicon dioxide, and silicon dioxide usually has a relative dielectric constant not more than 3.5.

Claim 8 seeks to protect a field-effect transistor. D1 discloses a HEMT device using an asymmetric gamma gate field plate structure, and specifically disclosed the following technical features (see, page 196 and Fig. 1 of D1): AlGaN/GaN heterojunction material-based HEMT device has a gate terminal field plate which is formed by an extension portion of the gate toward drain, and a silicon nitride SiN_x passivation layer having a uniform thickness formed below the gamma gate field plate and in the other positions of AlGaN barrier layer. What makes claim 8 different from D1, the closest prior art thereof, is that the insulating film formed on the Group III nitride semiconductor layer is made of silicon oxynitride SiOn. Based on the above-mentioned distinguishable technical feature, it can be ascertained that, the technical problem to be solved actually by claim 8, relative to that of D1, is to change the material and the structure of the surface protection film so as to further balancing the relationship among the current collapse effect, the gate breakdown voltage, the reliability and high-frequency gain of the HEMT device. Reference document 3 (DE) (Tan W.S., et al, th 10th IEEE International Symposium on Electron Devices for Microwave and Optoelectronic Applications, 2002: 130-135) also discloses (see, line 17, page 130 to line 27, page 131 of D3) an AlGaN/GaN heterojunction material-based HEMT device which has a SiON passivation layer low in stress.

Claim 9 seeks to protect a field-effect transistor. D1 discloses a HEMT device using an asymmetric gamma gate field plate structure, and specifically disclosed the following technical features (see, page 196 and Fig. 1 of D1): AlGaN/GaN heterojunction material-based HEMT device has a gate terminal

field plate which is formed by an extension portion of the gate toward drain, and a silicon nitride SiN_x passivation layer having a uniform thickness formed below the gamma gate field plate and in the other positions of AlGaN barrier layer.

Claim 14 is a dependent claim of any one of claims 1-13, and its additional technical feature in the characterizing portion is: said semiconductor layers structure includes a channel layer made of $In_xGa_{1-x}N$ and an electron supply layer made of $Al_yGa_{1-x}N$.

Claim 15 is a dependent claim of any one of claims 1-14, and its additional technical feature in the characterizing portion is: contact layers are arranged between said source electrode and a surface of said semiconductor layer structure and between said drain electrode and a surface of said semiconductor layer structure respectively.

Claim 16 is a dependent claim of claim 15, and its additional technical feature in the characterizing portion is: said contact layer is formed by an undoped AlGaN layer. Reference document 4 (D4) (JP 2002-359256A) discloses a semiconductor extension layers structure for producing HEMT devices (see, lines 8-14, column 2, and Fig. 7 of the specification), in which the substrate is made of sapphire, and the extension layers are 3 μm of undoped AgN channel layer, 3 nm of undoped AlGaN separate layer, 25 nm of Si-doped AlGaN barrier layer and 5 nm of undoped AlGaN separate layer, 25 nm of Si-doped AlGaN barrier layer and 5 nm of undoped AlGaN cap layer from top to bottom.

Claim 18 is a dependent claim of any one of claims 1-17, and its additional technical feature in the characterizing portion is: the semiconductor material for producing the field-effect transistor has a structure in which the channel layer made of $In_xGa_{1-x}N$, the electron supply layer made of $Al_yGa_{1-y}N$, and a cap layer made of GaN are sequentially laminated.

Copies of Documents B1-B3 are not attached as these references were provided with Applicant's Information Disclosure Statement of June 14, 2005.

Any document listed on the attached PTO/SB/08 was cited as being relevant during the prosecution of the corresponding Chinese application. An English translation of the foreign-language documents is not readily available; however, the absence of a translation or

an English-language counterpart document does not relieve the PTO from its duty to consider any submitted document (37 CFR §1.98 and MPEP §609).

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

STATEMENT

The undersigned hereby states in accordance with 37 CFR §1.97(e)(1) that each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three (3) months prior to filing of this Statement.

Although Applicant believes that no fee is required for this Request, the Commissioner is hereby authorized to charge any additional fees which may be required for this Request to Deposit Account No. 19-0741.

Respectfully submitted,

Date: March 11, 2008

By _____

FOLEY & LARDNER LLP
Customer Number: 22428
Telephone: (202) 945-6014
Facsimile: (202) 672-5399

George C. Beck
Attorney for Applicants
Registration No. 38,072

Phillip J. Articola
Registration No. 38,819